

REMARKS

Claims 1-7, 18, 20, 24, 26 and 28-29 were examined. Claims 1, 4-5, 18, 20 and 28 are amended. Claim 3 is canceled. Claims 1-2, 4-7, 18, 20, 24, 26 and 28-29 remain in the application.

The Patent Office rejects claims 18 and 20 under 35 U.S.C. § 112, second paragraph. The Patent Office rejects claims 1-2, 7, 18, 20, 24 and 26 under 35 U.S.C. § 102(e). The Patent Office rejects claims 1-7, 18, 20, 24, 26 and 28-29 are rejected under 35 U.S.C. § 103(a). Reconsideration of the pending claims is respectfully requested in view of the above amendments and the following remarks.

A. 35 U.S.C. § 112, second paragraph: Rejection of claims 18 & 20

The Patent Office rejects claims 18 and 20 under 35 U.S.C. § 112, second paragraph, as indefinite. Applicant amends claims 18 and 20 to address the concern raised by the Patent Office. Applicant respectfully requests that the Patent Office withdraw the rejection to claims 18 and 20 under 35 U.S.C. § 112, second paragraph.

B. 35 U.S.C. § 102(e): Rejection of claims 1-2, 7, 18, 20, 24 & 26

The Patent Office rejects claims 1-2, 7, 18, 20, 24 and 26 under 35 U.S.C. § 102(e) as anticipated by U.S. Patent No. 6,869,879 of Ryan (Ryan). Specifically, the Patent Office notes the method described in Ryan with reference to Figures 19-28 including base layer 120, cap layer 130, cap layer 1980, and ARC 1960.

Independent claim 1 describes a method including introducing an etch stop layer on a substrate; introducing a base layer on the etch stop layer; and introducing a dielectric cap layer on the base layer between an interconnection line and a contact point on the substrate. According to claim 1, the dielectric cap layer comprises alternating different material layers, wherein each respective layer of the alternating different material layers is selectively etchable with respect to the etch stop layer and the number of occurrences of each material layer is greater than one.

Independent claim 1 is not anticipated by Ryan, because Ryan does not describe a dielectric cap layer comprising alternating different material layers wherein the number of occurrences of each different material layer is greater than one.

Claims 2, 7, 18, 20, 24 and 26 depend from claim 1 and therefore contain all limitations of that claim. For at least the reason stated with respect to claim 1, claims 2, 7, 18, 20, 24 and 26 are not anticipated by Ryan.

Applicant respectfully requests that the Patent Office withdraw the rejections to claims 1-2, 7, 18, 20, 24 and 26 under 35 U.S.C. § 102(e).

C. 35 U.S.C. § 103(a): Rejection of claims 3-6 & 28-29

The Patent Office rejects claims 3-6 and 28-29 under 35 U.S.C. § 103(a) as obvious over Ryan in view of U.S. Patent No. 6,475,925 of Braeckelmann et al. (Braeckelmann). Braeckelmann is cited for teaching repetition of capping layers for the formation of a multi-level interconnect with respect to Figures 5-6.

Claims 3-6 depend from claim 1 and therefore contain all limitations of that claim. For at least the reasons stated with respect to claim 1, claims 3-6 are not obvious over the cited references. Braeckelmann does not teach a dielectric cap layer of alternating different material layers wherein the number of occurrences of each different material layer is greater than one.

Independent claim 28 describes a method including forming a planarized base layer over a substrate having a plurality of devices and forming a dielectric cap layer over the base layer. The dielectric cap layer is formed by alternating a first material layer and a second material layer a plurality of times, the second material layer formed of a material having a higher dielectric constant than a dielectric constant of a material of the first material layer. Collectively, the plurality of the first material layers is more than five times thicker than the plurality of second material layers.

Claim 28 is not obvious over the cited references, because the cited references do not teach or provide any motivation for forming a dielectric cap layer by alternating a first material layer and a second material layer a plurality of times and wherein collectively the plurality of

first material layers is more than five times thicker than the plurality of second layers. The discussion above with respect to claims 1 and 3-6 and the cited references is relevant here.

Claim 29 depends from claim 28 and therefore contains all the limitations of that claim. For at least the reasons stated with respect to claim 28, claim 29 is not obvious over the cited references.

Applicant respectfully requests that the Patent Office withdraw the rejection to claims 3-6 and 28-29 under 35 U.S.C. § 103(a).

D. 35 U.S.C. § 103(a): Rejection of claims 1-7, 18, 20, 24, 26 & 28-29

The Patent Office rejects claims 1-7, 18, 20, 24, 26 and 28-29 under 35 U.S.C. § 103(a) as obvious over U.S. Patent No. 6, 350,700 of Schinella et al. (Schinella) in view of U.S. Patent No. 6,127,089 of Subramanian et al. (Subramanian).

Schinella is cited for describing a method including introducing an etch stop layer 16, introducing a base layer 20 over the etch stop layer, introducing a dielectric cap layer 26 followed by a hard mask layer 30 and ARC layer 38.

Subramanian teaches cap layer 44 that may be a thick layer of TEOS or a multiple layer cap. Column 1, lines 52-53. An example of the multi-layer cap layer 44 is a 2,000 Å thick TEOS layer, a 1,000 Å nitride middle layer and a 800 Å thick top layer that is an organic bottom anti-reflective coating. Column 1, lines 53-57.

Independent claim 1 is not obvious over the cited references, because the cited references do not describe or provide any motivation for a dielectric cap layer comprising alternating different material layers where the number of occurrences of each different material layer is greater than one. As noted above with respect to Subramanian, the materials that make up the multiple layer cap layer 44 do not include occurrences greater than one of any material. Further, there is no motivation from Subramanian or Schinella to form such a multiple layer cap layer.

Claims 2-7, 18, 20, 24 and 26 depend from claim 1 and therefore contain all the limitations of that claim. For at least the reasons stated with respect to claim 1, claims 2-7, 18, 20, 24 and 26 are not obvious over the cited references.

Independent claim 28 is not obvious over the cited references, because the cited references do not describe or provide any motivation for a dielectric cap layer formed by alternating a first material layer and a second material layer a plurality of times. In this regard, the comments made with respect to the references in claim 1 are relevant here.

Claim 29 is dependent from claim 28 and therefore contains all the limitations of that claim. For at least the reason stated with respect to claim 28, claim 29 is not obvious over the cited references.

Applicant respectfully requests that the Patent Office withdraw the rejection to claims 1-7, 18, 20, 24, 26 and 28-29 under 35 U.S.C § 103(a).

E. 35 U.S.C § 103(a): Rejection of claims 1-7, 18, 20, 24, 26 & 28-29

The Patent Office rejects claims 1-7, 18, 20, 24 26 and 28-29 under 35 U.S.C § 103(a) as obvious over Braeckelmann in view of Subramanian.

Claims 1-7, 18, 20, 24 and 26 are not obvious over the cited references, because neither Braeckelmann nor Subramanian describe or provide any motivation for forming a cap layer of alternating different material layers wherein the number of occurrences of each different material layer is greater than one. Each of Braeckelmann and Subramanian teach multiple layer materials, but the multiple layers do not include different material layers wherein the number of occurrences of each different material layer is greater than one.

Claims 28-29 are not obvious over the cited references because, as noted with respect to claim 1, the cited reference do not teach or provide any motivation for a dielectric cap layer including a first material layer and second material layer alternated a plurality of times.

Applicant respectfully requests that the Patent Office withdraw the rejection of claims 1-7, 18, 20, 24, 26 and 28-28 under 35 U.S.C § 103(a).

CONCLUSION

In view of the foregoing, it is believed that all claims now pending patentably define the subject invention over the prior art of record and are in condition for allowance and such action is earnestly solicited at the earliest possible date.

Respectfully submitted,

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